J. Anat. (1998) 193, pp. 287–288, with 2 figures Printed in the United Kingdom

Correspondence

The sternalis muscle: an uncommon anatomical variant among Taiwanese

The sternalis muscle is an uncommon anatomical variant. It is located on the human anterior pectoral wall, superficial to pectoralis major. This muscle has been reported both in males and females, and in whites, blacks and Asians (Barlow, 1934; Kida & Kudoh, 1991; Shen et al. 1992; Bradley et al. 1996).

Although the importance of this muscle is still a mystery, various different interpretations have been made. Clemente (1985) considered sternalis to be a misplaced pectoralis major, although some embryologists have viewed it as part of a ventral longitudinal column muscle layer arising at the ventral tip of the hypomeres (Sadler, 1995). Sadler claimed that this muscle is represented by rectus abdominis in the abdominal region and by the infrahyoid musculature in the cervical region; in the thorax, this layer usually disappears but occasionally remains as a sternalis muscle. Kitamura et al. (1985) reported a case of congenital partial deficiency of pectoralis major accompanied by an enormous sternalis. Barlow (1934), on the other hand, claimed that sternalis represents the remains of a panniculus carnosus.

Of 207 Taiwanese cadavers (151 male, 56 female), dissected over 17 y in Taipei Medical College (from 1983 to 1997), 2 were found to have bilateral sternalis muscles, superficial to pectoralis major in the anterior thoracic wall. Both cases were male. Case A, found in 1983, was a 64-y-old male who had died of heart failure, and case B, found in 1997, was a 44-y-old male who had died of advanced tuberculosis. In both cadavers, a pair of sternalis muscles was clearly visible after removal of subcutaneous connective tissue.

This muscle appeared as a small superficial bundle located at the sternal end of pectoralis major, at right angles to its fibres and parallel to the sternum. The origins of the right and left muscles (upper end) met in the midline of the jugular notch. The insertions of the right and left muscles (lower end) were separated by 92 mm (case B), which gave the bundles an inverted V-shape. The upper left muscle bundle of case A (Fig. 1) was thinner than the right, while the right and the left muscle bundles of case B were symmetric (Fig. 2). The length of each muscle was 130 mm (A) and 152 mm (B); the width of the insertion was 24 mm (A) and 18 mm (B). In both cases, the insertion was diffuse and distributed on the superficial region of the 6th costal cartilage and the 6th intercostal space. The sternalis muscles were supplied by the perforating branch of the internal thoracic artery and the anterior cutaneous branch of the intercostal nerve.

The insertion and the frequency of sternalis differs between races (Last, 1972). The prevalence is low in Taiwan where we found only 2 cases ($< 0.5\%$) in 207 cadavers and Shen (1992) found only 1 out of more than 200. From our findings, there is thus a very low incidence of 1% in the Taiwanese (3 in total of approximately 400 cadavers). These rates are much lower than those reported in Japanese (13.1%), blacks (11%), whites (2.9 to 6.4%), and Filipinos (3.3%) (Barlow, 1934). In our findings, the incidence is statistically different between the Taiwanese and the oriental population. Nakano, Kurz & Wagenseil (quoted by Barlow, 1934) found the rate for sternalis muscles among Chinese to be 17.3%. Statistically, this is also different from our report. We believe this discrepancy in frequency between our findings and Nakano's to be at least partly due to the different sampling sources and partly due to the different subraces in Chinese (including Taiwanese). Combining our results with those of Shen's report, the frequency of this muscle in Taiwanese appears to be less than 1%, much lower than in other races.

In Barlow's report, sternalis was present both in males and females and was twice as often unilateral as bilateral.

Fig. 1. The sternalis muscle of case A. A pair of forceps have been inserted under the muscle. Anterior cutaneous branches of the intercostal nerve, 3 right and 1 left, have been ligated by black cotton thread.

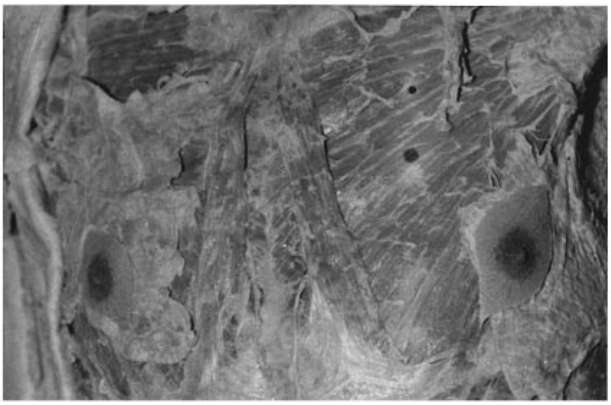

Fig. 2. Sternalis muscle of case B.

Interestingly, in our report and that of Shen et al., all cases with bilateral sternalis muscles were male. However, our own sample is too small to establish any significance.

Sternalis is an anatomical variant with no known function. Generally speaking, when a muscle contracts, the insertion is pulled by the origin. Therefore, contraction of sternalis, because of its particular location, may elevate the lower chest wall, an action achieved by other muscles in those without it. Thus sternalis, at most, plays an only accessory role in this function. As to its clinical significance, this muscle is visible in mammograms and on CT and MR imaging. It is important for physicians, especially radiologists, to recognise and be familiar with sternalis to avoid confusion with a malignant lesion (Bradley et al. 1996).

HELLEN JENG*
Department of Anatomy, *School of Medicine*,
Taipei Medical College, *Taipei*, *Taiwan*
SHUEN-JING SU
Department of Pathology, *School of Medicine*,
Taipei Medical College, *Taipei*, *Taiwan*

* Corresponding author at Department of Anatomy, Taipei Medical College, 250 Wu-Hsing Street, Taipei, Taiwan, ROC.

REFERENCES

Barlow RN (1934) The sternalis muscle in American whites and Negroes. *Anatomical Record* **61**, 413–426.

Bradley FM, Hoover HC jr, Hulka CA, Whitman GJ, McCarthy KA, Hall DA et al. (1996) The sternalis muscle: an unusual normal finding seen on mammography. *American Journal of Roentgenology* **166**, 33–36.

Clemente CD (1985) Muscle and fasciae. *Gray's Anatomy*, 30th American edn, p. 520. Philadelphia: Lea and Febiger.

Kida, MY, Kudoh H (1991) Innervation of the sternalis muscle accompanied by congenital partial absence of the pectoralis major muscle. *Okajimas Folia Anatomica Japonica* **67**, 449–455.

Kitamura, S, Yoshioka T., Kaneda M, Matsuoka K, Chen KL, Sakai A. (1985) A case of the congenital partial defect of the pectoralis major-accompanied by the sternalis with enormous size. *Kaibogaku Zasshi-Acta Anatomica Nippononica* **60**, 728–732.

Last RJ (1972) Upper limb. *Anatomy*, *Regional and Applied*, 5th edn, p. 82. Edinburgh: Churchill Livingstone.

Sadler TW (1995) Muscular system. *Langman's Medical Embryology*, 7th edn, p. 168. Baltimore: Williams and Wilkins.

Shen, CL, Chien CH, Lee SH (1992) A Taiwanese with a pair of sternalis muscles. *Kaibogaku Zasshi-Acta Anatomica Nippononica* **67**, 652–654.